

Zero Retries issue 0080 2023-01-06

Zero Retries is an independent newsletter about technological innovation in Amateur Radio.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Request To Send

Happy 2023 to all you Zero Retries Subscribers / Co-Conspirators!

I'm writing this issue of Zero Retries about a week in advance as I'll be traveling back to my hometown of Port Clinton, Ohio USA from 2023-01-03 through 01-09 to visit a very dear friend who is now on hospice care. Given the nature of the trip, I decided not to bring a laptop to work on Zero Retries. Thus there will probably be some Zero Retries Interesting news that will hit between 2022-12-31 and 2023-01-06 and not reflected in this issue... but I'll catch up.

Seeing some other newsletters and blogs, it's obvious that I got out of traditional synch with Zero Retries over the 2022 holidays. If I had planned ahead a bit better, A Vision for Zero Retries Interesting Amateur Radio in 2029 would have been a great "Christmas Present" for Zero Retries subscribers in Zero Retries 0078 on 2022-12-23, and Zero Retries 0079 on 2022-12-30 would have been a recap of 2022. I do plan to put out an 2022 recap, perhaps as early as Zero Retries 0081. I would have done that for this issue, but it's a lot of work to plow through a years worth of Zero Retries, so that will have to wait a bit.

Zero Retries 0079 exceeded 1000 Total Views in the first three days, which Substack explains as *The total number times this post was viewed as an email, on the web, or in the Substack mobile app*. That many "Total Views" in so short a time is a new record for Zero Retries.

I had intended to include at least some Zero Retries Interesting news in ZR > BEACON this issue, but between the two articles below, the dreaded (!) **Near email length limit** banner appeared.

de Steve N8GNJ

Followup on A Vision for Zero Retries Interesting Amateur Radio in 2029

I had a lot of fun writing A Vision for Zero Retries Interesting Amateur Radio in 2029 in Zero Retries 0079. As usual when I'm having fun writing... to the point of consuming the entire issue. Again, I believe that all of what I wrote there *is feasible*.

AmGEO Organization / AmGEO-200 Payload

I imagined a new organization to fund and support AmGEO-200¹ because existing² Amateur Radio organizations just don't seem that... receptive... to the energy, enthusiasm, and social media savvy of younger folks. Thus it seemed feasible to imagine a new organization - Amateur Radio GEO Association (AmGEO) that *would*. I was particularly proud to imagine this aspect of AmGEO:

Most of the operating expenses of AmGEO are covered by older members who chose to financially support AmGEO-200. It doesn't hurt that AmGEO transmits the names and callsigns of sponsoring members during the monthly AmGEO meeting held on AmGEO-200.

The transmission of names and callsigns for significant financial contributors would be akin to naming a building on a college or healthcare campus or a civic building for a primary contributor... or a concert organ³. I'll guess that there a number of Amateur Radio Operators who would enjoy making a significant financial contribution to an ambitious project like AmGEO-200 that included some public acknowledgement.

Evolution of Amateur Radio Repeaters

A sadder projection that I didn't make in the article is that by 2029 I expect that that there will be significantly fewer Amateur Radio repeaters, at least those that are located on tall buildings, broadcast towers, or mountaintops. One reason for that projection is (my observation) that Amateur Radio repeaters are simply getting less use, and with fewer users comes fewer volunteers and funding to keep them going. Another is that most high profile sites suitable for repeaters are no longer owned / managed by individuals that are sympathetic to Amateur Radio, and especially the practice of offering free or discounted site rent. Worst is that such sites increasingly require commercial quality (not older or homebrew) systems, an engineering study (to insure no interference to other users), and antenna installation and maintenance done only by professional tower crews. Those new costs make an Amateur Radio repeater infeasible for many Amateur Radio groups.

Thus, one way to make Amateur Radio repeaters more feasible and affordable is to combine multiple user groups, and multiple modulation systems, into existing (and upgraded) repeaters. That is already being done to some extent by [installing MMDVM modems into repeaters](#), allowing a repeater to provide multiple digital voice modes.

Software Defined Receivers - Missed Opportunities for Technological Innovation

I continue to be amazed at the capabilities of software defined receivers (SDRXs), and dismayed at how little the capabilities of SDRXs have changed Amateur Radio. The Amateur Radio mindset seems unable to let go of the concept of transceivers compromised by complexity, capability, and expense because of including a receiver. Now that we have SDRXs, why not "let go" of the concept of a transceiver and vastly simplify a radio by making it just a transmitter?

I attended Hamvention 2022 and one of the primary (for me) seminar speakers was Phil Karn KA9Q where he discussed his current project, KA9Q-Radio. It's (more than) unfortunate that Hamvention did not record KA9Q's presentation (or if it was recorded, it hasn't yet been made public). What KA9Q is doing is... amazing! [KA9Q's 2021 DCC paper](#) explains KA9Q-Radio in text, but his Hamvention 2022 presentation was far more compelling. Thus, to me, it's not much of a leap to imagine the AllVU SDRX.

One minor example of the power of an SDRX is that few Amateur Radio Operators have 6 Meter (6M - 50 - 54 MHz) radios, but it's a very useful VHF band that all Amateur Radio Operators can use. For the minor cost of as little as \$30 for a quality ([genuine RTL-SDR](#)) SDRX, all Amateur Radio Operators can *receive* 6M. Thus, imagine a group setting up a bulletin station on 6M that transmitted bulletins, files, etc. using a flood file protocol such as RadioMirror, FLAMP, or a more recent example, RattleGram / Ribbit, or perhaps even UUCP. (Doing so on a small scale is one of the many projects on the list for N8GNJ Labs in 2023.)

Black Box Radios

Another AmNet product, the *BB-100* (BB - Black Box) was a simple “black box” whose user interface was a smartphone / tablet app or a web app running within a computer’s web browser.

This didn’t seem like much of a projection, but rather an observation that Amateur Radio *radio units*, even those with minimal, remote control / display units, are increasingly problematic in modern vehicles. That, while simultaneously, vehicles are evolving to make it smartphone use convenient - magnetic mounting / inductive charging points on the dash, wireless audio integration, etc. Clip the smartphone into the magnetic mounting point, insert your smartphone earbuds, and bring up the “BB-100” app and you’re on the air. *Some* smart vendor is going to get this right, and soon. Such a product would blaze right past all of the existing Amateur Radio vendors - Blackberry versus iPhone redux.

Amateur Radio Standards Organization (ARSO)

This imagined organization and mission was based loosely on a concept called [Amateur Radio Engineering Task Force \(ARETF\)](#) by Kenny Richards KU7M and Bryan Hoyer K7UDR - kudos to both of them for their vision. Unfortunately, ARETF didn’t achieve much mindshare - partially my fault for not being able to give it much attention in competition with Zero Retries.

Operation Reach Out

Operation Reach Out was an actual project... just not for Amateur Radio. My imagined Operation Reach Out was inspired by the efforts of the [Wireless Internet Service Providers Association \(WISPA\)](#). WISPA is now a large telecommunications industry association, but in its early days WISPA members would regularly travel to Washington DC to talk directly to FCC personnel and explain their perspective of what they were doing in providing Internet access in rural areas using license-exempt spectrum. FCC personnel couldn’t believe that companies were doing so, let alone doing so successfully. Thus the “*yes, my company is doing this*” perspective face to face eventually persuaded FCC personnel to pay attention to the WISPs, their capabilities, and their unique needs. In my opinion, WISPA (and those early face to face visits) helped make the [Citizens Broadband Radio Service \(CBRS\)](#) usable for small Wireless Service Providers... and everyone else, not just for behemoth wireless telephony companies.

Amateur Radio Omnipedia

The Amateur Radio Omnipedia was first inspired by the success of the [Digital Library of Amateur Radio and Communications \(DLARC\)](#) and the frustration of trying to browse through the material assembled there. I’m confident that something like the Omnipedia will eventually emerge to make DLARC browse-able. But, an equal inspiration was a story told to me by an Amateur Radio Operator about their experience in trying to add good material about Amateur Radio Packet Radio to Wikipedia:

... tried to place Amateur Radio information in Wikipedia, but the vast majority of Wikipedia volunteer editors knew nothing of Amateur Radio so a lot of Amateur Radio information on Wikipedia was removed or “dumbed down” by (non-Amateur Radio) volunteer editors.

Per my source, this actually happened. Wikipedia can be a harsh environment at times. Thus with DLARC needing a better index, I think that the Omnipedia is an idea whose time has come. But, as with many other Amateur Radio infrastructure ideas, it really needs a long term perspective. Instead of an individual Amateur Radio Operator (or small group) getting a new domain and throwing together a website or wiki and be subject to the “account holder hit by a bus” issue, we need a better system for long term support of things like the Amateur Radio Omnipedia that can survive for a long period.

Amateur Radio Showcase

Amateur Radio Showcase, the imagined competition for video documentaries on Amateur Radio, was inspired by a recent *wonderful* documentary video - [HAM](#) from Kal Bailey, a Documentary Filmmaker student at the University of Montana. You might quibble that HAM was hardly a comprehensive overview of Amateur Radio... but after watching it you won’t want to. Imagine having a few such documentaries released every year.

GNU Radio / GNU Radio Companion for Amateur Radio

If you’ve ever seen a GNU Radio Companion (GRC) demonstration⁴ done by someone who really knows GRC, you immediately grasp the potential of being able to “build” a radio or modem out of conceptual building blocks. I’ll speak solely for myself in saying that what I think I need is “GNU Radio Companion With Training

Wheels - optimized for Amateur Radio". I would love to have the ability to have pre-built modules for things like, say, "9600 bps FSK Modem" and "50 % Forward Error Correction" and "Control settings for Kenwood TM-V71A", etc. Such a thing is, conceptually, "a simple matter of software, demonstration, documentation, bug fixes, and maintenance". Perhaps some community.

There are individuals out there that are capable of such work, but they're busy in school, building radios in hardware, etc. Paid work is paid work, and all things being equal, some people would love to work on a project like GRC4D-AR if they can get a multi-year grant to keep the roof dry, fridge full, and the bar tab paid.

Imagine how much fun Amateur Radio would be if we did have the ability to build exactly the kind of radio we want mostly by dragging and dropping blocks on a monitor? Well, I know I would enjoy that very much.

Hopefully this fills in a few of the blanks about A Vision for Zero Retries Interesting Amateur Radio in 2029.

Steve Stroh N8GNJ

Packet Radio Networking - Active and Growing

There were a number of mentions of Amateur Radio [5](#) data communications in December 2022 that served to illustrate (to me) that there's ongoing, and (I posit) *growing* interest and capable technology in Amateur Radio Packet Radio and packet radio networking in Amateur Radio.

High(ish) Speed Packet - Some Practical Advice on Breaking the 1k2 Barrier

(I became aware of this column in December.) This was a great Digital Connection column by Don Rotolo N2IRZ in the July 2022 issue of CQ Magazine (pages 70-75) [6](#). N2IRZ did a great tutorial about how to get surplus commercial radios working at data speeds higher than the "every radio will do it" speed of 1200 bps Audio Frequency Shift Keying (AFSK).

Rhizomatica Mercury

In December, Rhizomatica released their "Mercury" modem software package as open source. As I discussed in Zero Retries 0076, Mercury has been in use in a system (not Amateur Radio) and is thus well-proven. Mercury seems highly capable, incorporating Orthogonal Frequency Division Multiplexing (OFDM) techniques and Forward Error Correction (FEC) and it's potentially usable on VHF / UHF, not just HF. Mercury isn't usable as it was released - it's "just a modem" and will require integration into other existing systems, such as Dire Wolf, or perhaps an entirely new system.

Mobilinkd LLC TNC4

In December, Mobilinkd LLC [announced](#) on the mobilinkd mailing list that it's developing a successor to their popular [TNC3](#) - the TNC4, with some improvements over the TNC3:

- It has better low-frequency response which is needed to interface with more radios when doing M17 and 9600 baud.
- It fixes an issue with DC biasing which can occur due to the design of the multiplex PTT circuit. This could lead to clipping in the TNC3.
- It has over-voltage protection. We have had very few failures of the TNC3 in the field. A large portion of the failures we have seen were due to over-voltage on VUSB -- all the parts on the 5V rail would be blown. A common thread has been using cheap USB PD adapters in a vehicle while operating an HT. I suspect these devices have poor EMI handling and can switch to high-voltage in the presence of RF. So I added an OVP IC to the TNC. This seemed prudent given the next item.
- And, the number one requested feature of the new TNC: It has a USB-C connector.
- The firmware for the TNC4 will ship with M17 data support. And you can do M17 voice on

Android using a USB-OTG connection. M17 via BLE is hit or miss depending on the Android device.

While the tech of the TNC4 is interesting, it's more interesting (and encouraging) that Mobilinkd sees enough demand in the Amateur Radio market to justify designing and manufacturing the TNC4.

Rattlegram / Ribbit

Although it's not designed for Amateur Radio, [Rattlegram / Ribbit](#) employed a lot of useful technology such as (very robust) 50% Forward Error Correction and OFDM techniques to achieve 2800 bps. That data rate might not sound impressive until you factor in that it's 50% of the "full" data rate (the other 50% of the data rate is used for FEC) and it's using "acoustic" coupling which (I *think* would cause at least some data loss compared to a cable). Not to mention the modulation isn't optimized for the potential use of a "flat audio" connection in some Amateur Radio units. While the web page says:

Ribbit is open source and currently in its early stages of development.

I can't find a pointer to Github or other open source code repository. Hopefully that will come as promised. Once the source code for Rattlegram / Ribbit is available, it may be possible to make use of Rattlegram / Ribbit's modem technology in Amateur Radio, similar to Rhizomatica Mercury.

EastNetPacket Discussion of 6PACK

There was an interesting [discussion](#) on the EastNetPacket mailing list of "[6PACK](#)", a technique for using multiple TNCs with a computer back when serial ports on computers were somewhat scarce, expensive, and problematic. Basically, the serial port cabling of the computer and TNCs was configured to "round robin" the inputs and outputs of each TNC into each other (the first TNC's TX was connected to the second TNC's RX, etc.), and use special 6PACK firmware in the TNC. Data was passed into and out of each TNC sequentially and back into the computer.

As I read this email discussion, I was interested not so much in the technology of 6PACK (it was a solution for a situation that's no longer an issue now that we have USB and USB multiport serial adapters), but rather how *active* the discussion was. It reflected that there's a lot of interest in Amateur Radio Packet Radio (and more generally in Amateur Radio networking) and especially in creating, reviving, and growing Packet Radio networks such as [EastNet](#) along the East Coast of the USA.

Seminar on NinoTNC and NCPacket / TARPEN

An [email from Tadd Torborg KA2DEW](#) on the TARPEN mailing list mentioned a presentation that he and Nino Carrillo KK4HEJ gave in December to the [Online Amateur Radio Community \(OARC\)](#), a group based in the UK. KA2DEW mentioned:

OARC members are doing packet radio, recently bought a large number (40+) NinoTNCs and are pondering networking and whatnot.

For most of the two hour presentation, KK4HEJ explained the history, design, and some of the use case for the [NinoTNC](#). Then KA2DEW expanded on the use case of the NinoTNC as a key component of [Terrestrial Amateur Radio Packet Network \(TARPN\)](#).

It was quite interesting to hear KK4HEJ describe the technical evolution of the NinoTNC. For example, the NinoTNC was originally designed to do 9600 bps Frequency Shift Keying (FSK) modulation; 1200 bps Audio Frequency Shift Keying (AFSK) was added later for compatibility with “classic” TNCs. Another was that while there’s a fair amount of hardware in the NinoTNC, at its core it’s software running on a processor / Digital Signal Processor (DSP) chip - conceptually, not too different from “software” TNCs.

But, more than the technical aspects, it was even more interesting to hear the enthusiasm from KK4HEJ and KA2DEW about their respective roles. It’s apparent that there’s no profit motive or glory-seeking for either of them. KK4HEJ’s work on NinoTNC development, evolution, testing, kitting, etc. obviously takes a lot of time and effort, but his reward is seeing the enjoyment and use of the NinoTNC by others. Ditto the amount of time and work that KA2DEW puts into promoting, growing, and managing [NCPACKET](#), a packet radio network in North Carolina based on TARPN.

As mentioned in Zero Retries 0072, Jason Rausch K4APR (in cooperation with KK4HEJ) is developing a version of the NinoTNC using surface mount components. As with most boards that use surface mount components, K4APR indicates that he will sell this board already assembled.

VARA FM as a Benchmark

While all the above developments are welcome and have the potential to advance Amateur Radio Networking on VHF / UHF, to me, the current benchmark for how much can be accomplished on VHF / UHF is VARA FM which includes speeds up to 25 kbps, Forward Error Correction (FEC), channel sounding, on-air “matching” so that lower speed and higher speed stations can interoperate, etc. Of course, VARA FM is implemented as a proprietary system that only runs on Windows (and platforms that can emulate Windows). A future Zero Retries project is to create a “best practices” list for Amateur Radio VHF / UHF data communications based on the capabilities of VARA FM.

Again, all of these events occurred (for me) in December, 2022. We seem to be surrounded by insurmountable opportunities to create better data communications systems in Amateur Radio. I can’t wait!

Feedback Loop

- Zero Retries 0079 received many nice comments and compliments. My thanks to John Kreno N3XKD, Brian Webster, Ben, Rich Casey N5CSU, Tom Salzer, and Nate Bargmann for their comments in the first few days.
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Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out

Join the Fun on Amateur Radio for some pointers.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with wireless technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything!*
- Pseudostaffers [Dan Romanchik KB6NU](#) and [Jeff Davis KE9V](#) for continuing to spot, and write about “Zero Retries Interesting” items on their blogs that I don’t spot on my own.
- [Amateur Radio Weekly](#) consistently surfaces “Zero Retries Interesting” stories.
- Andreas Spiess HB9BLA’s YouTube Channel - [HB9BLA Wireless](#) features Zero Retries Interesting content.
- The [Substack email publishing platform](#) makes Zero Retries possible. I recommend it for publishing newsletters.

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Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc. I don’t use such information in any way other than seeing that most subscribers actually do read Zero Retries.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA.

2023-01-06

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Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I owe them from way back).

[1](#)

The -200 is from the practice of applying a [consecutive number](#) to Amateur Radio satellites / payloads that achieve orbit and are functional. QO-100 began service in 2018-11-15, so extrapolating ahead a few years from 2022, another GEO payload being numbered -200 seemed feasible, and AmGEO-200 had nice symmetry since QO-100 was mentioned several times.

[2](#)

The sole exception (in my opinion) is [Amateur Radio on the International Space Station \(ARISS\)](#). The primary mission of ARISS (in my view) is to engage younger folks in Amateur Radio and space.

[3](#)

An enduring cultural legacy in Seattle is the Watjen Concert Organ in Seattle’s Benaroya Hall which is given short shrift in the [BH About page](#): *In July 2000, the Seattle Symphony inaugurated the Watjen Concert Organ, a 4,490-pipe organ built by C. B. Fisk, Inc. The organ greatly increased programming opportunities for both the Seattle Symphony and other ensembles that perform in Benaroya Hall. I met the late Craig Watjen several times and he seemed, to me, a practical philanthropist, exemplified by his gift of the organ.*

[4](#)

There are, of course, [many such video tutorials on YouTube](#).

[5](#)

As longer term Zero Retries readers are aware, I often play a bit loose in including developments, projects, etc. that aren't specifically involved in Amateur Radio in the sphere of "Zero Retries Interesting". ZRI is a personal definition, often simply an evaluation as "*this is interesting, and close enough* to Amateur Radio" to merit a mention in Zero Retries.

[6](#)

Unfortunately that, and all other Digital Connection columns are only accessible to subscribers to CQ, or paid access to the CQ electronic archive.